

Synthetic Biological Membrane (SBM)

Completed Technology Project (2014 - 2016)



Project Introduction

The ultimate goal of the Synthetic Biological Membrane project is to develop a new type of membrane that will enable the wastewater treatment system required on exploration missions to operate for extended periods while requiring no maintenance, and using only available resources. Because current water treatment systems have a lifetime of less than 1 year, extending membrane life will benefit exploration missions by reducing up mass and crew time requirements associated with maintenance and resupply/replacement of membranes. The project will use synthetic biology to engineer organisms that create and replenish the membrane, and this new technology can be easily adapted for use in terrestrial waste water treatment plants.

Anticipated Benefits

NASA funded: The Space Synthetic Biology (SSB) project can improve the reliability and reduce the mass, power, and volume of NASA's next generation life support systems, particularly on ISS, based on lessons learned showing that "reliability" is the major limitation of ISS technology. SSB objective is to improve subsystem reliability by integrating biological and mechanical systems to create a new type of biomechanical subsystem. Improved reliability leads to a reduction in the amount of material, or mass, that would otherwise be required to be launched, leading to increase efficiency, in both time and cost.

NASA unfunded: Future exploration missions beyond Low Earth Orbit will require long-term (months) in-space. These missions will require low mass, more reliable water recycling systems than in use today. The system under development requires little or no maintenance for missions to, and habitats on, Mars. The product of this development project will be relevant to the NASA Advanced Exploration System (AES) Life Support System Program (LSS) that will be deployed in exploration mission scenarios. A Intended Mission Use Agreement for Technology Infusion has been signed with AES management.

OGA: SSB Project delivered the first synthetic biological membrane system to the Army TARDEC in Dec 2015. Provided training in Jan 2016. This is a 200 gal/hr Forward Operating Base water recycling system. Army to initiate testing in mid to late Jan 2016. This system uses the same membranes being developed in SSB but without the regenerable capability that is the current focus of the SSB project.

Commercial: Currently discussing with Bigelow Aerospace use of SSB in Bigelow FO water processor. Currently working with European Space Agency to develop flight hardware. Conducted joint ESA flight to ISS in 2015 and are planning on second flight in 2016.

Nation: California State Water Control Board recycled water policy Resolution 2013-0003 has as one of its goals to substitute as much recycled water for potable water use as possible by 2030. Specifically, to increase the use of recycled water over 2002 levels by at least one million acre-feet per year (any) by 2020 and by at least two million any by 2030. Currently working with State of California to initiate large scale testing of distributed water recycling using FO and SSB technology. SSB Project is currently operating a FO gray water recycling system in a 250



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Game Changing Development

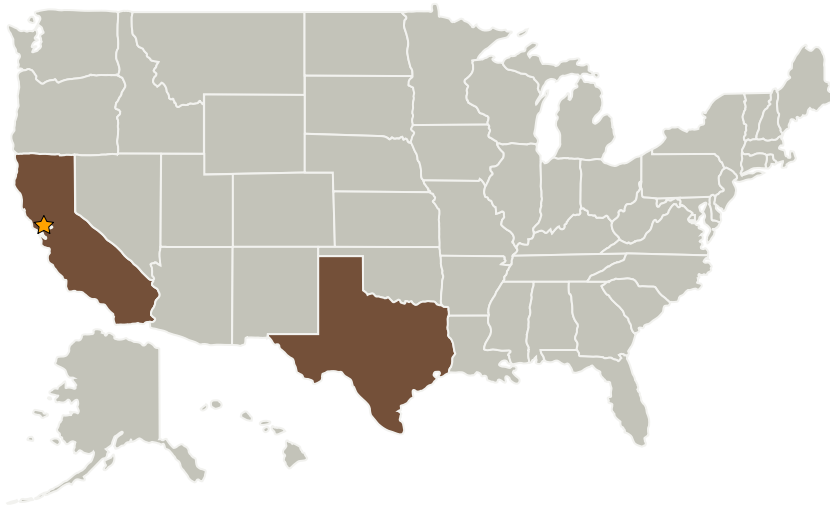
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person office building at Ames Research center.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Texas

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Project Management

Program Director:

Mary J Werkheiser

Program Manager:

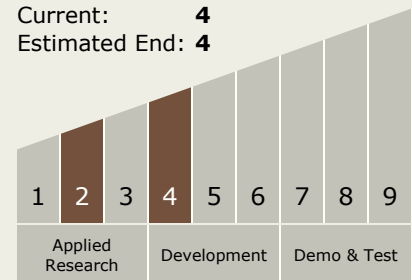
Gary F Meyering

Principal Investigator:

Michael Flynn

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Target Destinations

Earth, Mars